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VIEWS, NEWS AND INTERVIEWS.

At the recent reunion dinner of the New York Electric Club members, Mr. Lozier, formerly of Schenectady, N. Y., delivered a witty address on "Living Pictures at Schenectady." The first one he described was that of a number of natives sitting around the hotel stove masticating straws and occasionally dropping pearls of wisdom. The time was just when the General Electric forces were moving on Schenectady. After considerable mastication and expectoration the following conversation ensued between two of the group of natives:

"Hear'n tell th' Edison men is comin' to town."

"No, b' gosh!"

"Yes, b' gosh!"

"Wall, by go-o-sh!"

Another story was told by a widely known agent of the General Electric Company. He was bidding on an electric pumping plant for the General Electric Company and telegraphed the company's district manager for information on some figures regarding the size of the pump. The agent received this telegram in reply:

"Have you read my 77 circular letters?"

To which he responded:

"No. Only 47 in the office."

It was then discovered that the telegraph operator was at fault. The first message should have been:

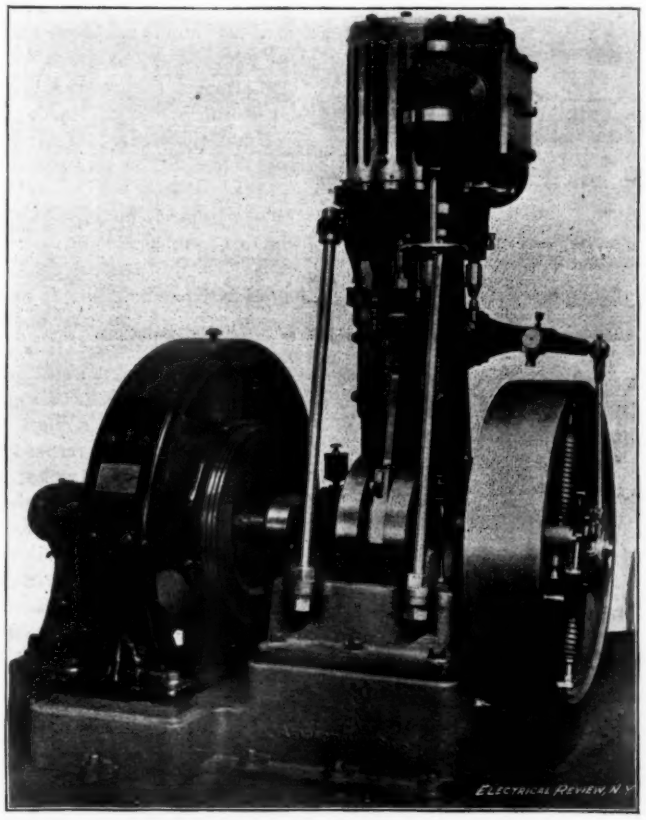
"Have you read my 77th circular letter?"

Col. William F. Wheeler, who located the first telegraph line in Minnesota, from St. Paul to Winona, in 1860, died recently at Helena, Mont., at the age of 70.

"It may not be generally known to the younger electrical men," said an old-timer, "that about 20 years ago the Western Union Telegraph Company had an opportunity to buy the Astor House property in New York city for $1,000,000. It was about the time that the telegraph company thought of erecting a building of its own. An uptown movement among hotel keepers was in progress and it was hard to find a tenant for the Astor house, because it was so far downtown. This led the Astor estate to offer it to the Western Union people."

One of the most liberal and magnanimous of corporations is the Western Union Telegraph Company. That concern having by special arrangement with the elements provided a fish pond in its Portland, Ore., office, by grace of its own goodness permitted one of its employés to haul out from under the counter 20 trout. In flashing the news of the catch over the habitable globe the matter of charging the clerk as much for the second lot of 10 fish as he is charged for the first 10 is not even mentioned.—*San Bernardino, Cal., Courier.*

An idiot with brilliant ideas has formulated a plan designed to please both the people who want open cars and those who refuse to ride in anything but closed ones. He proposes that one-half of each car be boxed in and the remainder left open. The prospective result would probably be similar to that which overtook the old man who tried to ride his donkey and walk at one and the same time, pleasing to none and disastrous to some.—*Boston Home Journal.*



ARMINGTON & SIMS DIRECT CONNECTED ENGINE.

The Ferris Wheel will soon be erected at Thirty-seventh street and Broadway, New York city. Old Vienna will be reproduced around it. At the World's Fair the wheel had 3,000 electric lights; in New York the number will be doubled. During the Fair the wheel went around 10,000 times and carried 2,000,000 passengers. The largest single load was carried October 19, when, at 12.30 o'clock, 1,768 people were in the cars. The largest day's business was October 10, when 38,000 people were carried.

Armington & Sims Direct Connected Engine.

In a recent issue of the ELECTRICAL REVIEW, in mentioning shipments of the Armington & Sims Engine Company, Providence, R.I., of four engines to the Manhattan Life Insurance Company, three to the Mutual Reserve Fund Life Insurance Company, three to the Home Life Insurance Company, two to Charles Broadway Rouss, and one to the Eye & Ear Infirmary, we were unable to present a suitable photographic and truthful illustration, but now take pleasure in so doing, not only as a compliment to this well-known firm of conservative engine builders, but for the benefit of our patrons interested in electrical development and progress. This combination of engine and generator with liberal proportions as presented is extremely compact in form. It will be observed that the usual flexible coupling has been abandoned, as it is entirely unnecessary where all bearings are in line. The flexible coupling is said to be of vital importance only where main bearings of engines are placed in movable heads, fastened to each end of bed casting. A short steel armature shaft with solid coupling is firmly bolted to solid coupling of steel engine shaft, thus uniting but two pieces in place of six. The self-oiling outboard bearing is easily removable and the same may be said of the armature and its shaft. The design is popular as the demand indicates, and the designers are amply rewarded.

The Copper Market.

Messrs. Lewisohn Brothers, the selling agents for the Montana group of mines and Lake mines, a combined output as large as the Calumet & Hecla, said last week: "We are not selling a pound of copper below nine and one-eight and nine and one-quarter cents. The only reason we know for the recent sale by the Calumet & Hecla at nine cents was that it had a big block of copper on hand which it could get rid of in no other way. The demand for copper is quiet at the moment, but as soon as general business revives electrical construction work will naturally be renewed, creating a large demand for copper for home consumption, which necessarily will advance the price."

Still Another Incandescent Lamp.

How cheaply can good incandescent lamps be made? This is an important practical question. A gentleman in New York, Dr. W. E. Forest, a practicing physician, has found his recreation during the last year in working at this problem, and has attained some interesting results. During this time he has been allowed more than 20 claims by the Patent Office, and has nearly a hundred claims still pending. His latest lamp, for which he has been allowed patents, can be made, he claims, for less than 10½ cents. This lamp has been tested thoroughly and is said to be the equal in beauty, candle-power and life of any lamp on the market. If the inventor's statements can be verified, as we have no doubt they can, the consumer of lamps will undoubtedly be benefited. The lamp under consideration has several novel features, as will be seen from the accompanying cut. It is not an "all glass" lamp; it has no platinum wires; no leading-in wires, properly speaking. In its manufacture no skilled labor is required, outside of making and attaching the filament.

The mount consists of a plain piece of glass tubing, one inch in length, open at both ends. One of the conducting wires is coiled within this tube, the other wire is coiled around it. The lower end of the tube is sealed in a brass thimble, in shape like an empty cartridge shell, which is filled with molten metal. The lower end of the mount tube, with the inside wire in position, is heated and set into this thimble. The metal in a liquid state fills the lower end of the tube and fuses to the wire. Thus, on cooling, the mount is hermetically sealed, and the thimble forms the central contact pole in the completed lamp.

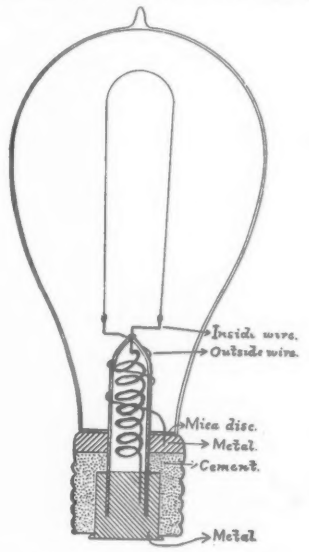
A mica disk that fits the neck of the bulb is slipped over the tube half way down, and the second wire, coiled, is placed in position; its outer end terminates just after passing through a pin hole in the disk. Then the mount complete, with the filament attached, is placed in position in the neck of the bulb, the lamp is heated, and a soft molten metal, whose co-efficient of expansion is the same as glass, is poured into the bulb neck, upon the mica disk, closing the neck and sealing it. A bit of copper wire hangs in the neck of the bulb to which the molten metal fuses itself. This wire is to be attached to the brass screw-cap around the neck of the bulb. The screw-cap (minus the porcelain insulating part and central contact button) is slipped over the neck of the bulb into position and a fused, elastic, non-conducting cement is poured in to fill the remaining space in the bulb neck, and around the neck between it and the screw-cap. This cement thus affords an additional seal to the lamp and, at the same time, fastens the socket cap without the use of plaster. The lamp is then ready to be exhausted. The coiled conducting wires are of steel and are eight inches in length. Owing to their length they prevent the transmission of heat from the incandescent filament to the seal, and yet are so firmly held by the mount that they do not vibrate and break the filament.

The cost of *material* in this lamp is as follows:

	Cents.
Bulb	2.7
Filament	1.
Mount	0.11
Metal	0.5
Wires and disk	0.01
Socket cap	0.70
Thimble	0.10
Cement	0.01
Total	5.13

or a little more than five cents per lamp. As there is little, if any, skilled labor required in the manufacture of this lamp, and but little hand labor, it is within bounds to put the total cost of the completed lamp at 10½ cents. The lamps have been thoroughly tested as to life and found to be the equal of any "all glass" lamp. In size and general appearance they are about the same as the Edison.

A number of well-known capitalists and bankers have formed a company,



THE FOREST INCANDESCENT LAMP.

called the Livgro Incandescent Lamp Company, to exploit these lamps and are fitting up a factory at Harrison, N. J., just opposite the Edison lamp factory. In 30 days the lamps will be on the market.

Fort Wayne News.

It was reported last week that the Fort Wayne Electric Company had not sold out to the Fort Wayne Electric Corporation. The Fort Wayne Electric Company was under contract to take the output of the Thomson-Houston or Fort Wayne Jenney Works and pay 20 per cent profit on the same. This contract has been sublet by the receivers to the Fort Wayne Corporation on the same terms, plus $2,000 per month to be paid by the latter to the former. The court has approved the contract.

About 20 of the employés of the sealing-in department of the General Electric Company's lamp factory in Harrison, N. J., struck last week on account of a reduction in the wages. The men claim that they are now only able to make $8 a week, and with the cut they will not be able to make any more than $5.

Gov. Greenhalge Vetoes the Bell Telephone Bill.

On June 27 the New York daily papers printed the following brief dispatch:

BOSTON, June 26.—The Governor this afternoon vetoed the bill permitting the American Bell Telephone Company to increase its capital stock to $50,000,000.

Governor Greenhalge waited until a few minutes of four o'clock on June 26 before vetoing the bill. Had he taken no action the bill would have become law on that day.

President Cutler, of the Metropolitan Telephone & Telegraph Company, when seen last Wednesday said to the ELECTRICAL REVIEW that he could not see wherein this adverse action of Governor Greenhalge would have any effect on the American Bell Telephone Company's licensees.

"I presume," said Mr. Cutler, "that if the company cannot get permission to increase its capital in Massachusetts it may incorporate in some other state—New York, for instance—where it can get what it wants."

This has been a favorite threat of the company, but it is believed that if it was incorporated in any other State than Massachusetts it would lose the strong New England following it now has.

"If I owned any Western Union stock," said an old telephone man, "I would mark it up ten points."

An attempt to pass the bill over the Governor's veto was made in the Massachusetts House on June 27. It was defeated, the vote standing 49 to 115.

Ex-Governor Long, counsel for the telephone company, said in an interview published in the Boston *Journal* that Gov. Greenhalge's veto message was evidently hastily written and without thorough knowledge. His objections appear to be: First, that the legislature fails to restrict this corporation as it has certain quasi-public corporations; but the Governor forgets that the same legislature has acted in both cases. Second, that the Bell company is engaged in electrical transmission. If this were the case it would be subject to the provisions of restriction cited by the Governor. Third, that the increase is not needed now; but the company ought to know best, and the Committee on Mercantile Affairs found unanimously that the increase is needed.

The *Boston News Bureau* expresses this opinion:

"The veto by Governor Greenhalge of the Bell telephone bill is a serious blow to enterprise in this State, and shows the tendency to cater to populistic and socialistic theories. The Governor's discovery that the company does not really need the increased capital shows a lamentable ignorance regarding the industrial field opened by Boston's greatest contribution to the civilized world.

"What the Bell Telephone will now do cannot be told. The situation is not encouraging. The company would like to stay in this State for it has been treated fairly by the General Court. It has confidence in our courts and its shareholders, who include many of our largest taxpayers, would prefer to add to the general tax purse of this State."

Another Boston paper quotes a Texas man as follows: "The Bell Telephone Company has nothing in Massachusetts but its residential and legal status, and to be downed in its own town will hurt its legal position in every State in the Union where it is defending its patented rights and property."

A bill has been introduced in the Massachusetts House permitting the Bell Telephone Company to increase its capital to $50,000,000, but providing that the stock shall be sold by auction. No opposition to this bill is expected. It will permit the company to offer the new stock to stockholders at market val to be named by the Commissioner of Corporations, and all stock not taken is to be disposed of by public auction. There is some talk that the Governor may veto this bill in order to be consistent with his veto message. If the bill becomes a law it will probably be the basis for the first experiment in stock at auction enforced by the legislators.

An Underground Electric Road for Vienna.

The Anglo-Austrian Bank and the firm of Siemens & Halske have submitted to the Board of Trade a detailed plan for a Vienna underground railway. It is intended to be an electric narrow-gauge railway, with double rails, and should begin at the Danube Canal, pass under the Central City to where it touches the western suburbs, continue under the Maria Lilferstrasse to the western terminus, and thence to the outskirts of the town to Schonbrunn and Penzing. Between seventeen and eighteen minutes would be the time for getting from one end to the other. The railway would run directly under the pavement, without touching the foundations of the houses. A single carriage, to be started at short intervals, is meant to convey forty passengers in ordinary times, while in the morning and evening, and Sunday and fête days, two cars might be added. The bank would begin to build the underground electric railway at seven points at once and would complete it in a year from the day when the concession is granted. The Viennese, who have no means of communication in the central part of the city, wish this undertaking every success.

LITERARY.

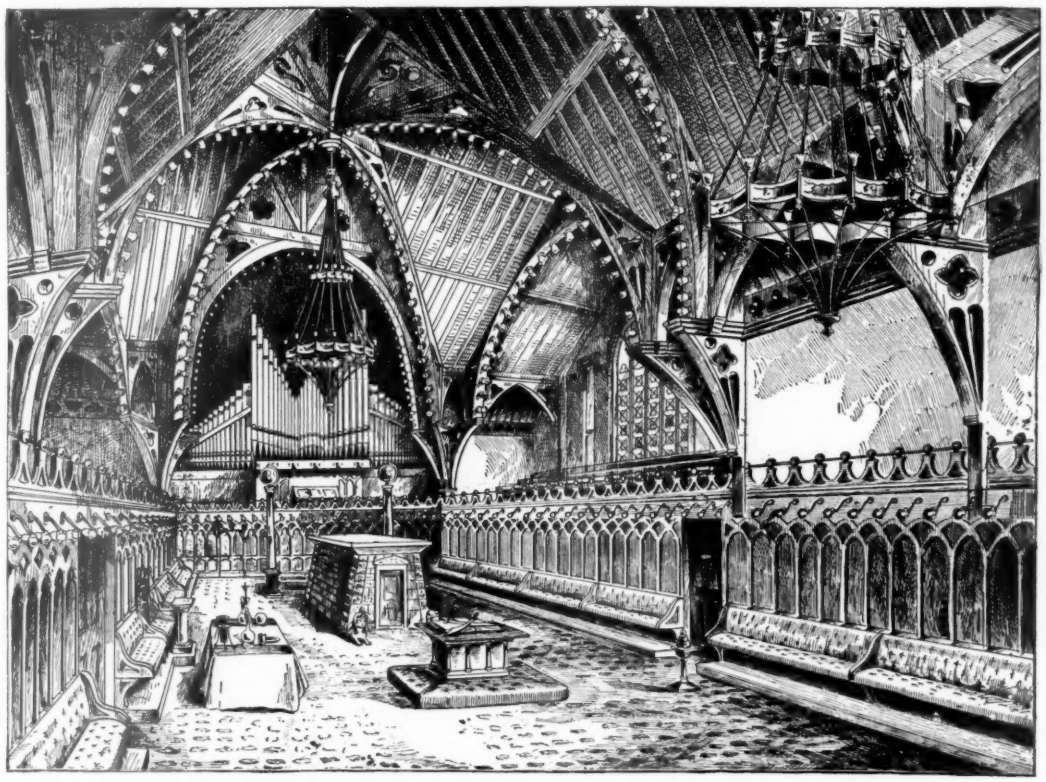
The possibilities of electric lighting are strikingly portrayed in an article entitled "The Light of the Future," which appears in Cassier's *Magazine* for July, from the pen of D. McFarlan Moore. Mr. Moore's treatment of the subject is unique, and the lightning effects which he describes, with the aid of numerous finely executed engravings, are sufficiently startling to attract widespread attention.

The report of the Lansing, Mich., water and electric light commission shows that during the past year the city's lighting plant paid $14,000 over operating expenses.

Electric Lighting Effects at the Aurora Grata Cathedral, Brooklyn, N. Y.

The accompanying illustration shows the interior of Aurora Grata Cathedral in Brooklyn, N. Y., which building has been equipped with an electric light plant, Edison system, of over 500 incandescent lights. The work of wiring, which was exceedingly difficult, owing to the high arched ceiling, was done by the Complete Electric Construction Company, of New York, and Okonite wire was used throughout the building. The lamps are red, white and blue, covered with ornamental shades made by the Phœnix Glass Company, and so controlled at the switchboard that any one color or all the colors can be used at one time, or a number of combinations of colors can be obtained, producing beautiful effects.

The switchboard, which was furnished by the Brooklyn Electric Manufacturing Company, is of black marble, and with its mountings forms a handsome specimen of what can be done in this line. As will be seen from the illustration, the building is architecturally artistic and the introduction of the electric light adds greatly to its beauty. The fire underwriters pronounced this installation one of the best that they have ever passed on, and so expressed themselves on the official certificate. The building is used for Masonic meetings, and among its frequenters are many well-known members of the electrical and street railway fraternities.



ELECTRIC LIGHTING EFFECTS AT AURORA GRATA CATHEDRAL, BROOKLYN, N. Y.

American Institute of Electrical Engineers.

At the regular monthly meeting of the council on June 20, 25 associate members were elected and 15 associates were transferred to full membership. The next meeting of the council will be held September 19. Thirty applications for membership are now on hand for consideration on that date.

GENERAL NOTES.

Cincinnati, Ohio, and Covington, Ky., will be connected by trunk telephone lines.

The International Bell Telephone Company has declared a dividend of five per cent payable July 5. Books closed June 30 and re-open July 6.

The American Electro-Therapeutic Association will hold its fourth annual meeting at the New York Academy of Medicine, in West Forty-third street, New York city, on September 25, 26 and 27. The sessions are to be held in the main hall on the ground floor, and the room immediately adjoining has been secured for an elaborate exhibition of electro-medical apparatus.

Knowing folks out on the old Boston road near New York city are able to identify the sites of their houses to inquiring friends by giving the number of the telephone pole opposite the gate. The gigantic sticks of the long-distance telephone line stalk along the road for many miles and, as every pole is numbered, a very clear itinerary may be made out for a strange traveler by the aid of the poles.

The Broadway and Seventh Avenue Railroad Company, of New York city, has won its fight with the Empire City Subway Company, Limited, in regard to its right to use the conduit running along its line of road from the Battery to Fifty-first street for its own signal wires. Judge Ingraham holds that the Empire City Subway Company has no right to maintain an action to enjoin the railroad company from maintaining electrical conductors in its conduit for the necessary and proper operation of its road, and has no exclusive right to maintain subways in the streets; and that the railroad company has not infringed upon the franchise owned by the Subway company.

AN UNDERGROUND ELECTRIC ROAD.

INFORMATION AND APPARATUS WANTED.

TO THE EDITOR OF ELECTRICAL REVIEW:

I beg to submit an account of an underground electric railway through the columns of your valuable journal, whereby I may hear from some of those who have had experience in such enterprises and would kindly save their fellow sufferers annoyance and expense by writing either to me or to the REVIEW of similar construction and its snags.

I, in connection with other gentlemen, propose constructing an underground railway in Berkeley, Cal., and beg to state that the city is practically a dry one, *i. e.*, at no time during the year are the streets completely covered with water. Besides having a splendid sewer system the city has a gradual slope from the foot hills to the bay. During our heaviest storms last Winter the streets over which the entire route will pass were without water in the center.

We have concluded, therefore, to make the system underground as follows: The rails are to be laid on stringers which will rest on about four inches of concrete and to be filled in on the sides with the same material. We will also place ties under the stringers about six feet apart. We will place a conduit, made of creosoted pine about 20 inches in diameter in the center to hold the wires and the trolley. On one side of the conduit and near the top we will place a main or mains from which the trolley is to be fed. On the other side and near the top will be placed the return wire. The rails will be well connected to the return wire. The trolley wire will be supported in the center. The opening or slot will be about as wide as that used on cable roads. The top of conduit will be made of timber covered with iron and so arranged as to be easily removed. At the bottom of the slot will project a guide for trolley arm made of some non-conducting material to prevent grounds. The conduit is to be connected to the sewers wherever it may be necessary in order to carry off any accumulation of water.

The line will be about seven miles long, that is, it will be a loop. The station will be in the center and supply current to two sides. The travel will not be very heavy. We have concluded to put on six cars with 25 horse-power motors each. The highest grade at any place is but seven per cent, and that for a very short distance. The balance will average between three and four per cent. We propose to use a 100 horse-power generator. The latter to be of the multipolar type. As this is but a small plant we propose to try to secure some apparatus that has been replaced by a larger generator. The cars we may secure from some road that has too many on hand. It is not our desire to be cheap or deal in second-hand goods. We propose, however, to pay for what we get and to so construct the road as to make it a profitable one to operate, even though travel be light. All apparatus will be received only on conditions of efficiency and good condition. I have not looked into the matter of rails yet and will be very glad to hear from some of the numerous subscribers of the REVIEW on that subject.

I would be pleased to hear from those having apparatus to sell and also from those who are sufficiently interested in electric railways to help make them a success mechanically and financially. In fact any correspondence on the foregoing subjects will be greatly appreciated.

Yours most sincerely,

J. GEO. GARDNER,
General Manager Berkeley Electric Light Company.

Berkeley, Cal., June 20.

The Schuckert Search-Light.

The Schuckert search-light, which the government is testing at Sandy Hook, N. J., stands on a wooden tower 150 feet high on the point of the Hook near the telegraph office. It is contained in a round box sixty inches in diameter and four feet in depth. Two carbons, one 1½ inches in diameter and the other one inch, are set in iron frames six inches from the reflector. The lens of the light is one-eighth of an inch thick and is divided into sections. The reflector is parabolic instead of oval, and sends the rays of light outward in parallel lines. It is one of the four largest search-lights made by the Schuckert company and the largest in the United States. It is of 200,000,000 candle-power. The box is mounted so that it can be turned to an elevation of 130 degrees and swung in a circle as easily as a steamer's wheel. It can be moved by an operator 75 feet away by electrical connections.

An electric road between Meadville and Titusville, Pa., is wanted.

EXPERIMENTS ON TWO PHASE MOTORS.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, PHILADELPHIA, MAY 1 , 1 94, BY DR. LOUIS DUNCAN, S. H. BROWN, W. P. ANDERSON AND S. Q. HAYES.

Within the last few years rotary field motors have been greatly improved, and the conditions for successful design are moderately well

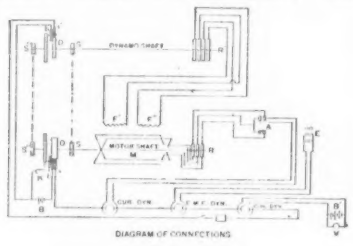


FIG. 1.

understood. The problem has been attacked mathematically, and results have been obtained which, while interesting, have not been submitted to the test of experiment. The mathematical treatment is difficult, unless many essential phenomena are omitted; indeed, it is only lately that

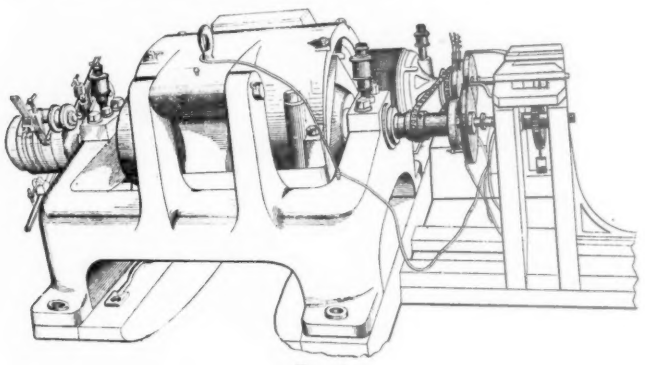


FIG. 2.

the solution of the case of a motor supplied from a constant potential circuit has been undertaken, and as this is the condition of actual practice the results even with their evident limitations are important and interesting. The phenomena that occur in the armatures of these motors are of special importance, but they have not yet been submitted to experimental investigation.

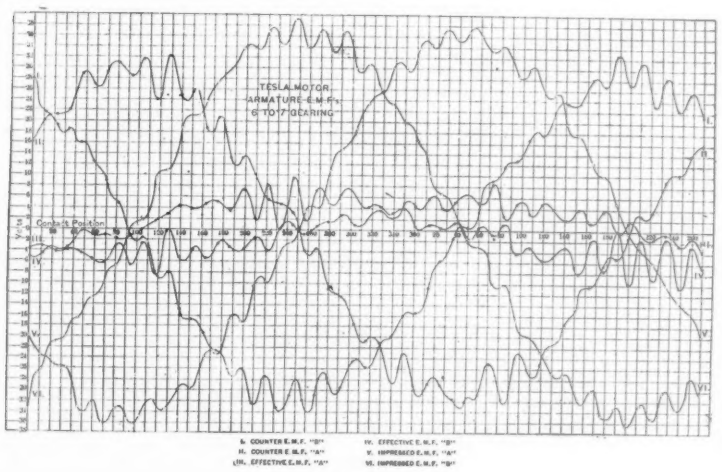


FIG. 3.

The experiments of which this article is a description were intended for the purpose of developing a method of obtaining the current and electro-motive force curves of multiphase motors, and of applying it to a two phase, two horse-power Tesla motor kindly furnished by the Westinghouse Electric and Manufacturing Company. While the results are probably correct for the machine tested, yet as the motor was small with inward projecting pole pieces the results will differ considerably from those that would have been obtained on a larger machine, or one without projecting pole pieces. It was impossible for us to get any other machine, and the development of a method is, we think, of as great importance as the results themselves.

In a rotary field motor, if the resultant field is not exactly uniform, but presents some irregularities—then if the difference between the speed of the field and the speed of the armature is not a multiple of both, the armature electro-motive force will not in general be a periodic curve, because if we consider an armature coil enclosing a maximum number of lines of induction, then when it again includes the maximum number, the field will be in a different position with respect to the poles, and its maximum value may be different. Or, to put it another way, if the difference of the speeds of the field and armature is not a multiple of both, then any particular armature coil will not have the same relative position with respect to both the field and the pole pieces in its successive positions of maximum induction. It is necessary then, in order to obtain periodic armature currents, that some form of gearing be employed.

If large machines are to be tested, where it would be inconvenient to transmit a large amount of power by gearing, the motor may be loaded until the desired speed of test is approximately attained, when a very light gearing between the dynamo and motor will serve to keep this speed constant, the gearing serving simply to check any small tendency toward a change of speed. In our experiments, the power to be transmitted was small, and the construction of the motor was such that we had no room for a gearing and for a coupling to a load. We consequently geared the motor to the dynamo, the motor energy being given back to the dynamo.

The apparatus experimented on consisted of a 25 horse-power two phase dynamo—an ordinary constant current machine supplied with four (4) collecting rings—and one (1) two phase, eight pole, two horse-power Tesla motor. The electro-motive force of the dynamo, as may be seen from the curves, was practically a sine curve. In our work the motor was not run up to its full capacity, as we were limited by the amount of power the gearing would safely transmit. We cannot better describe the armature winding of the motor than by quoting part of a letter written by Mr. Charles F. Scott, of the Westinghouse company.

"The one you have has, however, 41 slots. The odd slot was placed in this motor so that the relation of the armature teeth to the field poles was different in different parts of the circumference, and the forty (40) incipient dead points which might have occurred were avoided by the addition of the extra slot. The winding consists of four (4) layers; the first and third are exactly similar and coincident in the slots occupied, and the second and fourth are similarly related. The four coils in each layer are connected in series and short circuited."

The idea was to make the mutual induction of an armature coil, with respect to the poles, a sine curve. Of course, with a limited number of slots, it is impossible to have the mutual induction of the field and armature exactly a sine curve. But it is possible to very nearly accomplish this, especially in large armatures, and the importance of it is beginning to be appreciated. Mr. Scott, of the Westinghouse company, was one of the first to appreciate the importance of the armature winding and the proper method of doing it, and he deserves much credit for his quiet and persistent work, which has resulted in the production of excellent motors instead of voluminous papers.

It is, of course, true that the period of the armature is the sum of the periods of the field and the armature. As we wished to obtain the curve of the armature current by the contact method, it became necessary to get contacts whose period was the sum of the field and armature periods. This was obtained by an arrangement of apparatus shown in Fig. 1. In the figure, S and S^1 are the two sprocket wheels which gear the two machines together and give them the desired relative speeds. S^{11} and S^{111} are two others which gear the graduated disks which carry the brushes. D and D^1 are the two instantaneous contact disks—one mounted on each shaft—and a, b, c, a^1, b^1 are the wiping brushes. K is a condenser, and B a charging battery. b and c make the circuit through the battery and condenser once every revolution, thus keeping the condenser charged. When a and a^1 make simultaneous contact, the battery circuit is broken and the condenser is discharged through the movable coils of the dynamometer, which are all connected in series. F and F^1 are the motor field coils. R and R^1 the rings of the motor and dynamo, respectively. E is a double pole, double throw switch, to which are connected the terminals whose potential difference curves are desired. M is the motor armature, and A is a switch in the circuit of the current instrument. B^1 is a battery which sends a steady current through the large coils of a dynamometer. This dynamometer is used as a correcting instrument, and the resistance in the condenser circuit is regulated to keep its deflection constant. If the brushes are set together on the contacts, and then the two machines revolve with a given speed ratio, say 4 to 3, the brushes will again be simultaneously on the contacts when the machines have made, respectively, 4 and 3 revolutions. If the ratio was 7 to 6, the machines would make 7 and 6 revolutions before the contacts would again be coincident. In this way we obtained the needed instantaneous current.

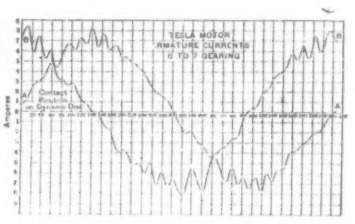


FIG. 4.

After obtaining one point on the curve in this way, and wishing to obtain another point, we must shift our brushes through angular distances proportional to the speed ratio of the two machines; otherwise they would not make simultaneous contact again. Having shifted them in this ratio (say if the ratio is 6 to 7, we would shift 10 degrees on the dynamo disks, and six-sevenths of 10 degrees on the motor disk), we obtain another point on the curve. To accomplish this easily we gear the brushes together in the same ratio as the armatures are geared, as is shown in Fig. 1. Our gearing both for the brushes and armatures consisted of sprocket wheels and chains and was very satisfactory.

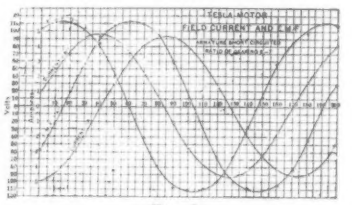


FIG. 5.

As the machine we tested was small and was run much below its rated electro-motive force, it was not, of course, particularly efficient, and as the armature efficiency is approximately the ratio of the armature speed to the field speed, this ratio was comparatively small, thus enabling us to use for measuring it a form of dynamometer which has been described before, and which was invented by one of us for obtaining such curves. It consists of a stationary coil carrying the current whose curves are to be obtained, and a movable coil through which passes an instantaneous direct current, obtained by making the circuit on the armature disks before described. If this instantaneous current occurs when the alternating current is zero, we

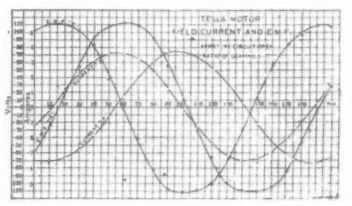


FIG. 6.

will get no deflection of the instrument. If it occurs when the alternating current is maximum, we will get a maximum deflection, and, in general, the deflection will be proportional to the instantaneous value of the alternating current. The dynamometer used had a long period and was well damped, and we had no difficulty in reading even when the period of the armature current was as much as one-quarter second.

If very efficient machines were to to be tested, where the period of the armature current is very large indeed, then some electrometer method or a telephone method would be used, or the deflection of a galvanometer needle in the field of the current could be easily photographed.

The curves we have obtained are as

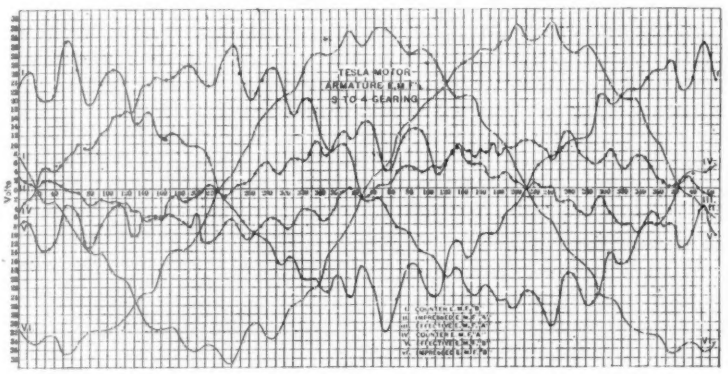


FIG. 7.

follows: The electro-motive force applied to the armature; effective electro-motive force of the armature; the counter electro-motive force of the armature; the armature current; the value of field electro-motive force and current for open and closed armature circuit. These for ratios of 3 to 4 and 6 to 7.

We also obtained the various currents and electro-motive forces when the armature was held stationary, with and without resistance in the outside circuit. There are really three distinct sets of curves: those relating to the 3 to 4 gearing, those for the 6 to 7 gearing, and those in which the armature was stationary. The angular positions do not correspond for the first two sets. For the second

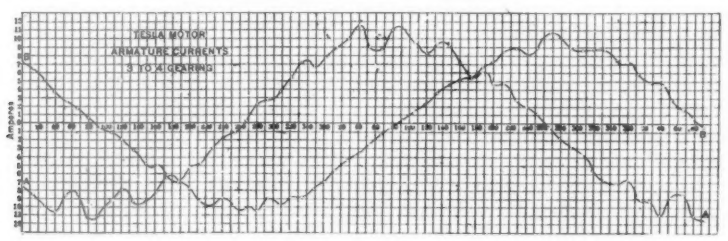


FIG. 8.

and third they very nearly correspond. This is due to the fact that we did not at first clearly appreciate the importance of permanently fixing the relative positions of the armatures of the two machines. Afterwards we made marks on each armature, and if, for any reason, we took off the gearing, we replaced it so these marks came opposite points which we fixed on the frames of the two machines. It should also be remarked that the curves for the two sets of armature coils marked A and B should not in general present the same irregularities, as their relative positions with respect to the poles and the resultant field are different. The dynamo being a four pole machine, this must be taken account of in calculating the angles on the base line. In Figs. 3 and 4 the contact positions should be multiplied by two (2). The length of an armature curve in terms of the positions of the dynamo brush should be $360\times4/2=720°$ in the case of the 3 to 4 gearing, and $360\times7/2=1260°$ for the 6 to 7 gearing. We have not the same confidence in the results of the 3 to 4 gearing as for the 6 to 7 gearing, the latter being taken from several sets of observations which checked very well.

The curves of the applied electro-motive force (curves V and VI, Fig. 3, and II and VI, Fig. 7) are obtained in the following manner: The armature was held stationary while the field revolved at its normal rate. The reading of our electro-motive force dynamometer then gave us a point on the electro-motive force curve. The armature was then moved through a given angle while the brush on the dynamo disk was moved through an angle corresponding to the ratio of gearing of the two machines. In this way another point was obtained on the curve. What we obtained was the electro-motive force applied to the armature when there was no current flowing through it, and when the gearing was 3 to 4 or 6 to 7, according to the relative movement we gave the motor armature and the dynamo brush. It should be remarked that all of the armature curves marked electro-motive force curves are obtained when the armature circuit is open, and therefore do not correspond to the actual condition of affairs when the armature is closed, as they do not contain the effects of armature reaction and self induction.

The effective electro-motive force of the armature given in curves III and IV, Fig. 3, and III and IV, Fig. 7, were simply measured by opening the armature circuit and getting the potential difference on the motor terminals when the motor was geared to the dynamo with ratios 6 to 7 and 3 to 4. The difference between these curves and the curves of impressed electro-motive force is the counter electro-motive force, and is given by curves I and II, Fig. 3, and I and IV, Fig. 7. We could have obtained the counter electro-motive force by supplying the fields with continuous currents whose ratio to one another would be that of the two phase currents and varying the relative values of these currents as we vary the point of contact of our instantaneous current. This would have been a laborious task and was not necessary. It was not possible to obtain these quantities by direct observation when the armature circuit was closed and when the machine was running under normal conditions.

In Fig. 4 is given the armature current of the motor with a gearing of 6 to 7, and in Fig. 8 is given the current when the gearing is 3 to 4. If we compare these curves we will see that the current is more irregular

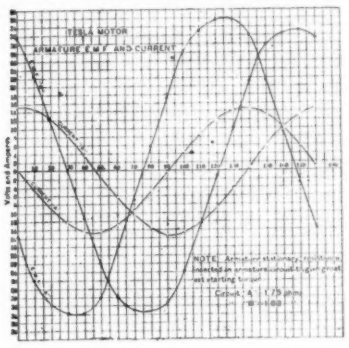


FIG. 9.

with the higher efficiency than with the lower. Again comparing the curves of effective electro-motive force for the two gearings, we see again that the irregularity is greater with the higher efficiency. If we consider that the current would follow this curve of effective electro-motive force, but for the armature reactions and self-induction, we can see that these effects have their good as well as evil side. The effective electro-motive force is, of course, the difference between the applied and the counter electro-motive forces, and

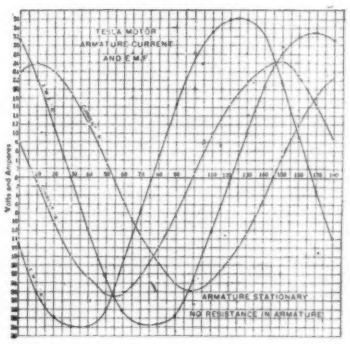


FIG. 10.

if these are irregular their difference becomes the more irregular as they are the more equal in value, that is, as the efficiency of the motor is higher; so that while in this machine whose maximum armature efficiency was made about 87 per cent, the irregularity is considerable; it would be very much exaggerated in a larger motor whose armature efficiency might be 97 per cent or 98 per cent, and in this case great care should be taken to produce a perfectly regular field. The effect of the armature reaction and self-induction is to decrease these irregularities.

If we consider for a moment the theory of the two phase motor, we

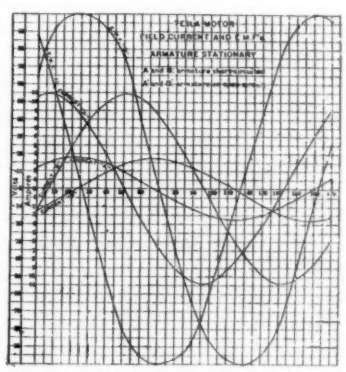


FIG. 11.

will remember that the armature efficiency is theoretically (leaving out losses in the field iron) $\frac{p^1}{p}$ where p and p^1 are respectively the angular velocities of the field and of the motor armature. We will also remember that the lag of the armature current behind the effective electro-motive force is taken as $10° = \frac{(p-p^1)\,L.}{r}$

If we look at the curves, however, obtained with the motor experimented on, we will see that the armature current is irregular, and therefore the actual heating would be greater than that calculated from sine curves; that is, the armature efficiency is always less and the drop in speed is always greater than the theoretical value, and may be very much less if the armature current is irregular. As has been pointed out, this fluctuation in the armature current would be exceedingly great if the self induction and armature reaction of the motor did not tend to wipe it out. The effect of the self induction being to damp the most of the waves of shorter period; that is, the irregularities.

It seems to us that the most important curves we have obtained are those of applied and counter electro-motive force and the armature current. They show at once the great importance of designing a machine whose applied and counter electro-motive forces are both sine curves, and the method may be easily used to experiment on actual machines and to find out if this condition is fulfilled. Again the comparison of the effective electro-motive forces with no armature current with the fall of potential due to the armature current shows us that there is some beneficial effect from self induction in the armature. The principal results show that the special machine does not give us regular currents and electro motive forces, but it is to a large extent due to the fact that in these small machines considerations of economy make it necessary to wind the field coils on spools instead of winding them through slots out in the field iron.

In designing a motor to give absolutely regular electro-motive force curves we must take two things into account. The field due to the dynamo current must be regular, and the armature winding must be such that it will give a regular electro-motive force in a regular field. To satisfy this condition in the field windings, projecting pole pieces should certainly

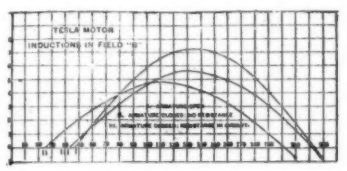


FIG. 12.

be avoided. To satisfy the condition in the armature would require an infinite number of armature windings, but it can be practically satisfied in the larger machines with a reasonable number of windings. It must not be understood that it is specially easy to accomplish this. Figs. 5 and 6 give us the input of the motor at full load and with an open armature with a six to seven gearing. Figs. 9, 10 and 11 show the field and armature electro-motive forces and currents when the armature is stationary, and in one case short circuited, and in the other case has outside resistance in its circuits. Fig. 12 gives in arbitrary units the induction through a coil wound around one of the pole pieces under the conditions stated.

We do not wish to add to an already lengthy paper a prolonged discussion of the curves we have given, especially as we hope to be able to experiment on a larger machine, the results from which will be of much greater importance; but we think that the curves we have given show that the design of rotary field motors requires careful experimental study, and we believe that such a study may be easily made, even for machines of large capacity.

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The careful business man recognizes the electric fan as an aid to Summer trade.

A revival of business seems to be indicated by the advertisement of the Edison lamp works at Harrison, N. J., for female lamp operatives.

The sharp depression in the bonds of several of the Brooklyn, N. Y., surface and elevated railway lines is partly attributable to liquidation by holders who were alarmed at the inroads upon the business of the respective lines made by the trolley systems. It is a matter of fact also, as anyone who has occasion to travel on any of the Brooklyn elevated lines can testify, that the lack of accommodation, on account of infrequent trains, drives much business to the trolley companies.

ELECTRIC POWER FOR NEW YORK'S L ROADS.

We are pleased to learn that negotiations are pending between the Manhattan Elevated Railway Company and the General Electric Company for an electrical plant to take the place of the steam locomotive system now in use upon the elevated railways of New York city. There is little doubt that if a price satisfactory to both parties can be reached, and the economy and facility of electricity can be demonstrated by practical experiments now under way, the officers of the Manhattan company will seriously entertain the substitution of an electric motor system for steam. Negotiations have progressed as far as a meeting of the engineers of both concerns and an exchange of specifications and estimates. It is said that the project has been arrested temporarily by what the Manhattan people regard as the excessive cost of the new plant. The detailed estimates of the General Electric Company have been figured out to aggregate $8,000,000, which is regarded as excessive. Electric power would be cheap at any price. Let there be as little delay as possible in its adoption.

AMERICAN BELL TELEPHONE AFFAIRS.

The interest in Bell Telephone matters has been greatly stimulated by the Governor's veto of their bill, and speculation is rife as to what their next move will be. The company's Boston offices have been overrun with reporters of the daily press seeking information, but the company refuse positively to make any statement. Indeed, as Mr. W. A. Hovey informs us, there is, as yet, absolutely nothing to say. No action of any kind has been taken, and the probabilities are that none will be taken for some months at least. The situation will, undoubtedly, be talked over by the directors and action of some kind taken, but the Bell company are not in the habit of doing anything in a hurry, and whatever course they decide on will be adopted only after mature deliberation. Mr. Hovey facetiously remarked that they did not need the extra capital for the payment of current expenses and that they were not contemplating insolvency just yet.

The names of three new subscribers were received by the ELECTRICAL REVIEW, Tuesday last, on *one* postal card. This was a very satisfactory return for one card. Springfield, Ohio, is where these three hail from. There were other new subscribers in the same mail, but only this one case of triplets.

LIGHTNING AND NERVES.

TO THE EDITOR OF ELECTRICAL REVIEW:

We often hear of people, especially females, having a "fit of the nerves" during the approach and passage of a shower accompanied by lightning. Curiously these little disturbances are termed *thunder* storms, even by the officials of the United States Weather Bureau, and curiously, too, people who get disturbed seem to be frightened at the thunder and not at the vivid flashes of lightning. If they would reflect a moment they would know there is nothing to fear in a crash of thunder; that is an after result altogether caused by the lightning, or electrical discharge between cloud and cloud, or cloud and earth. Anyone who gets struck by lightning in a serious way does not hear the thunder. That is tantamount to saying that when you hear the thunder the danger is past.

Very many people actually suffer torments during the prevalence of one of these storms, but such torments are usually self-inflicted, though the victims will not admit this to be true. They are convinced that they are in great danger, subjectively hypnotized by their own fears and aided by the absurd treatment of so-called physicians who cater to this class of nerve patients who persist in calling them into consultation and never get cured till they discover the remedy does not lie in pills and decoctions, but in a little common-sense administered through the ear and brain.

There is little cause for fear indeed. The death rate by lightning is probably far lower than by any other of the recognized accidental causes of death. Sun-stroke does not seem to be much feared, and certainly there are no people foolish enough to run down into the cellar amid screams and tears lest a ray of sunlight should strike them. Of the many comparatively unusual causes of death all show a vastly higher death rate than lightning.

Usually this nervous dread of lightning is most senseless, amounting almost to imbecility. One standing on Broadway at the Post Office would have no ground for alarm by the falling of a brick from the cornice of the Tribune building, yet this is about a parallel case with the average nerve fright in lightning storms. The bolt strikes somewhere and then one, two or more seconds later comes the terrific crash of thunder. But as sound travels only 1,120 feet per second, the location of the flash and consequently the danger point would be 1,120, or 2,240, or more feet distant.

Fear under such conditions is silly. Then, too, people are ordinarily near or at the surface, while in their immediate vicinity are high buildings which are sure to receive the stroke by reason of their height. Did any of these hypnotics ever know lightning to strike the street pavement in a city or town? Or a dog kennel in a farm house yard?

People who have this fear of lightning should post themselves and they will become reassured. They have

the fear, either because it has been instilled from childhood by nervous mothers or nurses, or because they have allowed themselves to grow into it and have unconsciously become hypnotized subjectively, the hypnotic impression then being that lightning is a constant menace and they must go and get in a dark corner somewhere. It does no good actually, but like the frightened ostrich which shoves his head into the sand, they cannot see the flashes, hence are out of danger.

It would be far better for such people, and for the martyrs who have to listen to their absurd fears, if they would sit at a window watching the magnificent spectacle of lightning and amuse themselves counting the seconds elapsing between the flash and the thunder, in fact face both the spectacle and the music. Let them drive away all fear by studying the phenomenon a little and profit by the true old "saw" about familiarity.

T. M.

New York, June 20, 1894.

PERSONAL.

Mr. Nikola Tesla has had the degree of LL.D. conferred upon him by Columbia College.

Mr. W. B. Bolton, general counsel of the Brush Electric Company, was a recent visitor to New York.

Mr. Henry G. Issertel has joined the electrical department of the H. W. Johns Manufacturing Company, of New York.

Mr. W. C. Bryant, of the Bryant Electric Company, Bridgeport, Conn., returned last week from a 10 days' trip through the West.

George Cutter, of Chicago, left for home last Friday after spending a week in New York. While in the city Mr. Cutter made arrangements to handle the "Chicago" wire exclusively in the West.

Mr. Frank Smith, who for a long time past has filled the position of superintendent of the Citizens' Street Railway Company, of Memphis, Tenn., has severed his connection with that corporation.

Mr. Henry Guinard, of the Paris *Figaro*, is visiting the United States and is interested in a new method of manufacturing glass in the shape of pipes, cells, etc. It is thought that these pipes may be used for laying underground wires, and capitalists of this country are investigating the matter.

Mr. Cyrus Ondeck Baker, Jr., of the large platinum importing house of Baker & Company, is enjoying a western trip these warm days with the equanimity of the true philosopher. The return of business, following the probable end of tariff agitation, leads Mr. Baker to conclude that business will rapidly revive.

OBITUARY.

We sincerely regret to learn of the death of Mr. C. I. Hague, of the New Haven Insulated Wire Company, on June 16, by drowning. He was out in a canoe on Whitney Lake, near New Haven, Conn., with his partner, when the canoe was accidentally capsized. Mr. Hague was unable to swim and in spite of his partner's heroic efforts to save him, he was lost. Mr. Hague possessed a charming personality and was well known and esteemed among electrical people.

OUR BOSTON LETTER.

G. M. Angier & Company, of 116 Bedford street, this city, who are exclusive contractors for apparatus manufactured by the Mather Electric Company, in New England, have just closed a contract with the Gardner Electric Street Railway Company, of Gardner, Mass., for one 160 horse-power Mather multipolar generator. Messrs. Angier & Company are devoting special attention to the equipment of street railway plants, and as the Mather generator in its present form has all the latest improvements, they will undoubtedly get a good share of the business during the present season.

Speaking of fires, "it is an ill wind that blows nobody good," and the exceptionally heavy losses throughout the country during the past six months have made manufacturers and builders look about for some efficient method of protection. This has naturally boomed things in the automatic fire alarm business, and the Electric Heat Alarm Company, of this city, have been one of the first to feel the increase. General Manager F. S. Palmer, with his usual progressiveness, has made immediate arrangements for handling the increase of business, and has leased a new factory for a term of years, in which their facilities are more than doubled. The new quarters are located at 145 Hight street and will be occupied about the first of July, and being equipped with all that is necessary in the way of modern machinery, they can turn out first-class work at the lowest possible prices.

A very successful experiment in electric hose signaling was conducted at fire department headquarters in this city a few days ago, and after an extended trial under various conditions, the results were pronounced very satisfactory by the fire underwriters and heads of the department present. The operation of the electrical device is extremely simple, and the idea is to convey a code of signals from the fireman at the nozzle to the engineer of the apparatus, by means of which instant communication can at all times be obtained, and the supply of water regulated as necessity may require. Two lines of insulated wire are run through the fabric of the hose, fully protected from external injury, and at the same time wholly clear of the water way. These wires are fastened into the metal couplings at each end of a length of hose, and these sections when screwed together form a continuous electrical connection. By pressing a button at the nozzle end a code of signals is sounded from a bell on the engine, operated by a dry battery. By this means the engineer is made instantly aware of the wants of the fireman, and can give him more or less pressure as he may require without loss of time, and without calling a fireman from the front to carry orders. Aside from greatly facilitating the work of the firemen, the underwriters claim the device will tend to lessen the damage from water, which is often an important factor. During the recent trial water was shut off and received again at the nozzle in two seconds after sending the signal.

Boston, June 30. H. G. T.

OUR CHICAGO LETTER.

The incandescent lamp suits will come up for final hearing on July 10. In the meantime the companies in suit have suspended the manufacture of lamps.

The Consumers' Electric Light Company propose to compete with the Edison company for the lighting in the heart of the city, provided they can secure an ordinance.

Mr. Frank P. Mack, the manager of the Chicago office of the Underwood Manufacturing Company, is one of the jurors in the appeal trial of Prendergast, the murderer of Mayor Carter Harrison.

Mr. Philip Dawson, of London, called upon the electrical fraternity this week in search of information concerning the latest approved methods of electric traction. Mr. Dawson is in partnership with Mr. Blackwell, formerly president of the Bentley-Knight company.

Mr. George A. McKinlock, president of the Central Electric Company, believes that it is a cold day for a hot wave when it blows no one good, for while the present wave is distressingly disagreeable it is causing the Lundell fan motors to go with a rush that reminds one of the crush at a bargain counter.

Mr. W. H. Cothren has accepted a position with Mr. Beggs, in Cincinnati, and will return to his first love, "central station details." During his stay in Chicago he won many friends, who were sorry to have him leave. He also gained some practical experience in gas engine work, having been engaged in perfecting a new type of gas engine. F. DE L.

Chicago, June 30.

The Constitutional Convention and Trusts.

William P. Burr, of New York, introduced in the Constitutional Convention at Albany, N. Y., on June 26 a new amendment to prevent the organization of trusts, which reads:

Combinations by and between any corporations, copartnerships or associations of persons, or the making of any contract or agreement by and between any corporations, copartnerships or associations of persons, directly or indirectly, or in any manner whatever for the purpose of creating or tending to create a monopoly to control the use or to regulate the charges for the use of telephones or telegraphs shall be illegal and void.

And it shall be the duty of the legislature convened immediately after the adoption of this Constitution to cause such laws to be passed as may be necessary to ascertain and establish just and reasonable maximum rates of charges to be paid for the use of telephones and telegraphs.

Interior Conduit and Insulation Company's Dividend.

The Interior Conduit and Insulation Company, 44 Broad street, New York, has declared a five per cent scrip dividend. Under a resolution of the board of directors this scrip dividend is "to be converted into fully paid capital stock when the proper steps have been taken to provide for an increase of capital stock and that pending such conversion the aforesaid scrip shall, so far as legal, possess all the qualities of stock and be entitled to all such dividends or privileges as may hereafter at any time be declared upon the outstanding capital stock, and provided further that such scrip shall be converted into stock before the declaration of the first cash dividend."

North American.

I have called attention from time to time concerning the "gutted" condition of this property, stating that it was little better than a shell. The annual report which was issued last week amply substantiates this statement. It shows debts of $1,808,118, which is a decrease of $910,302. Against this the assets decreased $2,847,707. The total assets are $10,205,000, against which there is stock outstanding of $39,767,200 and a floating debt of $1,808,018. During the panic the company sold all of its Northern Pacific, Wisconsin Central and Chicago and Northern Pacific securities, and all the assets which are left are those which cover the Milwaukee and Cincinnati railway and power plants.

There was a very warm reception given the report at the annual meeting which was held in Newark. The management was backed by a majority of the proxies, and consequently forced the adoption of the report. A motion to adjourn eight days for a consideration of the report was defeated, as was also a motion to investigate the condition of the property and the disposition made of the assets.

In the report the statement was made that the Milwaukee property for the first seven months of 1893 showed a large increase over the previous year. That the panic made a heavy falling off in earnings, so that the net result for 1893 was $408,625, as against $405,495 in 1892. It is believed that the net result in 1894, owing to economies, will be larger than 1893. In November last the West Side Street Railway Company and two smaller companies were consolidated with the Milwaukee Street Railway Company and brought under the lien of the first mortgage.

Cincinnati advices are to the effect that North American ownership in the Cincinnati plant does not represent a majority of the stock, and that it is worth about $10 per share. The statement is made that the construction of the plant was bungling in its nature and necessitates constant remodelling. It is said that General Electric is also a large owner in the plant, and that probably the two interests control the property.

Dow, Jones & Company, who very seldom express an opinion, in commenting upon this report, say: "The company's assets consist of stock and floating debt (already enumerated), a lot of defaulted street railway bonds, a lot of stock of the same railway, a Cincinnati Electric Light plant, value unknown, miscellaneous assets $539,217, a lot of disgusted stockholders, two officers, nine directors, two offices, one stock register and an unprecedented reputation. There is not one word about receipts and expenses. We never saw such a report before—no comments can do it justice." BAIN.

Important Lamp Decision.

As we go to press we are informed that Judge Dallas, of Philadelphia, holds that the Edison lamp patent has expired and that Buckeye lamps can be lawfully sold.

THE TELEPHONE AND THE RAILROAD.

READ BEFORE THE ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS, DETROIT, JUNE 14, 1894, BY CHARLES SELDEN.

(Concluded from page 318.)

Why not use the quicker method of the telephone for, at least, ordinary communications along a railroad? Because, they say, there is no record. I beg leave now to say to this party that, from an experience of many years, I find upon railroad wires especially, owing, doubtless, to their free use and the very wrong idea that it costs no money to transmit free telegrams, that 50 per cent of the business sent upon the wires should be sent by mail, and that 50 per cent of the business transacted is of such a character that "record" does not cut a figure.

I believe that with the present state of the telephonic art, that while it does not or will not supplant the telegraph, it should become a most valuable adjunct and time and expense saver of that arm of the railway service. I think I am safe in saying this without the fear of meeting much, if any, opposition, that if our systems were fitted telephonically that it would not be 60 days before the use of the telegraph lines would be reduced 50 per cent. That would be brought about by the transmission of intelligence verbally of such a character that "record" would not be absolutely necessary, and would take away from the existing telegraph lines a mass of business which has no rightful place upon them, and which should now be sent by train mail. But I am going to take a step forward even of this, and take, what will be called by some of you, I presume, a radical position, but I shall take it, defending myself with a full statement of how to operate in connection with that position. I now say that I believe it as safe under proper rules and restrictions to move trains by telephone as it is to do so by telegraph, and in order to bring to your minds more clearly of what the difference in the present method, if you will excuse the assumption on my part, would be, the use of the telephone up to this time has been on the part of the sender and the receiver about the state of affairs existing between a person dictating to a stenographer or two persons conversing together. In other words, they use the wire and its instruments in exactly the same way as they would the air in a room, and they have become so accustomed to doing this with but little or no interruption on the part of the receiving party that they cannot help but carry this out in the transmission even of messages which have been written, which the receiver has to write down and which are to be delivered as would be an ordinary telegram. I wish to say here and now that when a party writes out a message to be transmitted by telephone and the operator transmits it by word of mouth and the receiver indites it and delivers it, that there is as full, complete and all around record as exists with any Morse telegram that has been transmitted; therefore, if messages are written first, transmitted by telephone, written again and then delivered, so far as "record" is concerned we stand absolutely upon the same ground as we do in the telegraph. Ah, but you say the chances for error are greater because 55 may be written "65" and "35" may be written "certify." This is true, and I might cite an instance wherein by reason of the Morse errors of this character creeping in, but I am willing to allow that with the telephone in the ordinary method of use the chances for error are greater than they are through a misinterpretation of Morse signals or a bad transmission of same. I assume, for instance, that we wish to send by telephone a message, as follows:

Toledo, O., June 1, 1894.

To JOHN GORDON, Chicago, Ill.,

When in conscience sake will you be conscious enough to send me thirty-five certified copies of our act of incorporation? Answer.

W. L. BROWN.

Now I will try in a brief way to delineate to you about what the transaction will practically be. I assume now that this is not a public service, simply just such a service as might happen to be between any of the stations on your railroad.

Toledo calls Chicago. Chicago answers.

"Hello, Chicago?"

"Yes, Chicago."

"Here's a message."

"Wait a minute until I get my paper."

"Go ahead."

"Toledo, Ohio, June 1, 1894.

"To John Gordon, Chicago, Ill.:

"When in conscience sake will"—"Hold on, hold on, I'm not a shorthand man! Go ahead, Chicago, Ill." "When in conscience sake will you be"— "When in what?" "When in conscience sake."— "What state?" "I did not say 'state,' I said 'sake.'" "Shake?" "No, not 'shake'— 'sake;' s-a-k-e." "Oh, yes. What's that word in front of that?" "Conscience." "Did you say 'conscious?'" "No, I said 'conscience.'" "Oh, yes; go ahead." "When in conscience sake"—"All right"—"will you be conscious—" "Hold on a minute; broken pencil! Go ahead." "Will you—will you be conscious enough"— "Hold on; is that 'conscience' again?" "No, it is 'conscious,' c-o-n-s-c-i-o-u-s." "Oh, yes; go ahead." "Will you be conscious enough—will you be conscious enough to send me thirty-five certified copies"—"Hold on. Are there two 35's in there; is that thirty-five thirty-five?" "No, only one, thirty-five certified copies." "All right, go ahead." "Copies of our act of incorporation." Answer. Signed, W. L. Brown." "That's all right. I will read it back to you—"When in conscience sake will you be conscious enough to send me thirty-five certified copies of our act of incorporation. Answer. Signed, W. L. Brown." And Toledo answers: "That is correct."

Now the receiver of this telephonic message looks at the copy, some words are written hurriedly, he has three or four words scratched out where he had wrong ones and it will never do for him to send that in to General Manager Gordon or Superintendent Gordon, as the case may be, so he sits down and makes another copy of it, and in rewriting he is just as apt to make an error as he was to make an error in receiving the original, but he finally gets it in pretty good shape and it is ready for delivery. I beg leave to say that while I have used words here that are hard to transmit, yet I have done so purposely and have sought to get those that were the hardest; but it is not an overdrawn picture. You have all had experiences of this kind, and it is just this kind of experience that has brought this new art into disrepute until it has been regarded as exceedingly limited in its scope in the transmission of even ordinary everyday business.

I will present now, if you choose, what I see fit to term my method, and I term it mine because I know of no others who have used it as an entirety until I did. Toledo calls Chicago, who answers "Hello!" "Hello, is that Chicago?" "Yes." "This is Toledo. Here's a message." "Wait until I get my paper; all right, go ahead!"

From Toledo, Ohio, June 1, 1894.

To J-o-h-n G-o-r-d-o-n, C-h-i-c-a-g-o. W-h-e-n i-n c-o-n-s-c-i-e-n-c-e s-a-k-e w-i-l-l y-o-u b-e c-o-n-s-c-i-o-u-s e-n-o-u-g-h t-o s-e-n-d m-e t-h-i-r-t-y-f-i-ve c-e-r-t-i-f-i-e-d c-o-p-i-e-s o-f o-u-r a-c-t o-f i-n-c-o-r-p-o-r-a-t-i-o-n? A-n-s-w-e-r.

(Signed) W. L. B-r-o-w-n.

Chicago says "I will repeat," and does so, of course, correctly. I have cited this only to bring to your minds more forcibly the fact that the trouble is not in the art, but is largely in the method of handling the art, just as there was no trouble comparatively in the art of transmitting Morse characters to move trains when it originated, but there was trouble in the method of the use of that art.

By pursuing the course which I here lay out the receiver is not at all hurried, he can easily keep up in copy with the sender and even novices comparatively may do excellent work, so far as speed is concerned. When written by hand it will be as speedy as the other means. For the ordinary business of a railroad company it is perfectly feasible and a more than reasonably quick service is given and at the same time it rids the telegraph wires of a mass of stuff, which, as I stated, has no business upon them, leaving them free, if you choose, for the more important work of train and car movement. The general manager with telephonic communication of a good character stretched out to his general superintendents can in five minutes' conversation every morning with each one of them not only get the whole situation, but all the minor details which would be brought about by a verbal report that now frequently take hours in their transmission by telegraph, and if perchance he, or those he might designate in his office, desired a record further than a verbal report by telephone, it certainly could be transmitted by train mail, corroborating what had been received by telephone. The recent expiration of a very important patent in the telephonic art brings this subject closer to the railroads than before, and for that reason I thought best to call your attention to it with this in view, that if at the moment, without large expense, you could not cover your entire system, you could to a very large extent cover reasonable distances at a very slight expense indeed, and be educating properly a corps of people whom in your hour of need you would find to be a safe and strong body upon which to lean.

Young Men in Charge.

A representative of the REVIEW recently in Hartford visited the establishment of the Billings & Spencer company. It was his first visit to this concern and he fully expected from the magnitude of the plant to find that the members of the concern were gray-headed men. He was agreeably surprised in this respect (not that gray hairs are not honorable, but he was young himself), in meeting the junior Messrs. Billings, who were in a thick rush of business, which is the normal condition of this concern. The REVIEW man on asking where the elderly men of the firm were was told that they were "a-fishing." A little closer conversation with his informants renders the REVIEWITE reasonably satisfied that the senior members were enjoying peace of mind, knowing the juniors were on deck. This is only another instance of the young men engaged in the electrical business.

That $50,000 Prize.

The New York State Board of Railroad Commissioners has issued a circular letter to competitors for the $50,000 prize offered by the Metropolitan Traction Company of New York city for an improved system of motive power for street railways, giving the correspondence leading to the announcement of the withdrawal of the offer.

When the law authorizing the Commissioners to act as judges in awarding the prize was passed the Board notified the company that applications to enter the competition had been received from all over the world.

In answer to this letter Secretary Charles E. Warren, of the company, wrote on May 15, saying that it had been expected that the law would be passed early in the session. Finding that the law was not passed Mr. Warren says:

The company proceeded to employ experts and conduct the investigation which it was originally proposed to have the Railroad Commissioners conduct, and has spent a large sum of money, exceeding the $50,000 which the company proposed to award in determining the same question which was to be the subject of investigation and award. This company is about to enter upon a large expenditure, based upon the results of the inquiries, and should prefer to await the results of some practical experiments which it is now entering upon as the result of contracts with one or two electric companies before deciding to go on with the matter of the award.

In other words, the company has itself conducted the investigation, and has passed beyond the stage of inquiry, and has determined for itself upon an improved motive power, and is about to put it in. It will, of course, be seen that such a state of affairs presents an entirely different situation.

To this the Commission replied regretting that the withdrawal of the offer had not been announced earlier. It says:

Such notification would have permitted the Board to inform the public and the legislature of the abandonment of your offer, and it would seem in justice, particularly to the persons who have been induced by the publication of the offer to make application for permission to compete for the prize, that such notice should have been given. As agreed to in our circular letter to competitors, the Board will immediately take steps to inform them that your offer has been withdrawn, and so far as it is concerned we consider the matter closed.

Car Fenders in Illinois.

The Illinois Supreme Court has decided that street railway companies must provide fenders around the wheels of trailers as well as grip and motor cars. The decision is based on the suit brought in favor of a nine year old boy who was killed by jumping off an Evanston avenue horse car when the car was in motion, one of the rear wheels passing over his body and causing death. The court affirmed a verdict of $5,000. The same Court also affirmed a verdict of $10,000 in favor of a stenographer who was injured in falling off a car owing to her dress being caught in the platform of the car from which she was alighting. Execution was stayed on the defendant promising to at once satisfy the judgment.

Business Improvement.

"Trade improves slightly and we continue to receive orders and I firmly believe business is improving." Thus writes the leading official of one of the most widely known engine companies in New England. He is right; there is an improvement in business and we hope to see it become decided and strong within the next 30 days.

The following directors of the United Electric Light and Power Company, of New York, were elected at the stockholders' meeting last week: Charles Francis Adams, August Belmont, C. J. Canda, Paul D. Cravath, Marcellus Hartley, G. W. Hebard, Henry B. Hyde, Brayton Ives, C. H. Jackson, Ph. Ferd. Kobbe, D. D. Parmley, James Stokes and George Westinghouse, Jr.

STREET LIGHTING BY ALTERNATING ARCS.

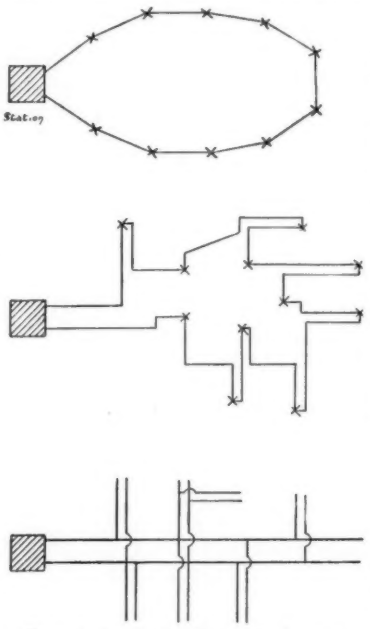
READ BEFORE THE CHICAGO ELECTRICAL ASSOCIATION BY CHAS. G. ARMSTRONG.

There are many phases in electrical developments that seem to me like rolling a stone over a hill; the task is a hard one, and requires the steady application of all the energy at your command until a certain point is passed, then the boulder rushes on ahead, and you must be exceedingly nimble to keep it in sight. I remember how, some fifteen years ago, I went up to our North Side water works and saw a single arc lamp with the large letters below it: "Danger—Electric Light." What steady and constant toiling did it take to educate the public to the point where less and less notice was taken of the "danger," and more and more notice of the "electric light," till, finally, arc and incandescent lighting have both burst upon us with such a momentum that we are amazed when we look at the proportions of the electric light industry.

The history of the alternating current distribution for incandescent lighting shows the same steady massing of energy leading up to the sudden spread of this method, and it now appears to me as if we had reached a similar period in the history of street lighting by alternating currents. There are many places, even in districts for which incandescent lighting meets the general need, where a few arc lamps can be used to good advantage, so it was to be expected that alternating plants would find some calls for arc lamps to be used on their circuits. But there has been such an amount of work done in developing alternating arc lamps—no less than 14 having appeared on the market since last June that there must be a larger field for these lamps than that of mere incidental adjuncts to an incandescent plant. So far these lamps have only been used in small numbers here and there when no series arc circuits were at hand, and the common impression seems to be that this is their limit of usefulness. But I cannot agree with them. I believe that with all its faults and drawbacks the alternating arc lamp has some very good points of merit, and that when these are coupled with the advantages of alternating current distribution for long distances, the alternating arc will lend itself to the conditions of modern practice about as readily as the commonly used series arc lamp. Indeed, I believe it perfectly feasible to use alternating arcs for extended street lighting with as good results as would be expected from a series arc plant under the same local conditions.

At first thought the planning of a street lighting system for a city, and of using multiple instead of series wiring, may seem expensive, but let us look at both sides. If we plat the ideal town plant we find the lamps all arranged along a circle or loop about as shown in Fig. 1, and no doubt the series arc system, with a single wire, is then the simplest and cheapest. But in practice we find that the towns are not often laid out to suit such simple wiring plans, while Councilmen Smith and Jones and Brown all have their notions as to the location of the lamps, so the actual diagram is more like Fig. 2, much of the wiring being in loops, so as to nearly double the length of the circuit. Of course, every foot of this wire has to carry the full current (say 10 amperes), whereas in multiple system like that shown by Fig. 3, the size of the wire would diminish as we get further from the stations, both systems using about the same voltage (2,000). This difference in the cost of the wire may amount to considerable. In the case of a 60 light town plant, for which I recently made the estimates, the alternating current transformer system showed a saving of 10 per cent on the wire over that which would have been needed for the same lamps on the ordinary series circuit.

As to the arc lamps themselves there has been quite a change during the past year in the voltage adopted for them. The early forms were



FIGS. 1, 2 AND 3.—PLANS OF STREET LIGHTING SYSTEMS.

adapted to be run from 50 volt transformers with a resistance in series. Then this resistance was gradually reduced so as to run three lamps in series on a 100 volt circuit, thus giving better results and taking less energy. Lately the manufacturers have gone a step further by planning their lamps to work direct from 30 volt transformers, leaving out all resistance. The lamps themselves are as economical as the series lamps, each consuming about 450 watts for a nominal 2,000 candle-power. Of course, there is the extra cost of the transformer, but this, together with the alternating arc lamp itself, costs no more to-day than a first-class series lamp. The loss in the transformer does not count for much as the transformer is always worked at full load and, therefore, at its greatest efficiency. What is more, the transformer tends to steady the fluctuations in voltage at the lamp, so that this cannot creep up to 50 or 57 volts, as it often does with series lamps.

One of the advantages gained by running arc lamps in multiple is that every lamp is independent of the rest. If a lamp should get out of order, it would keep its crankiness to itself without affecting all of the others. Indeed, the most that it could do would be to short circuit itself and blow the fuse of the transformer. The same advantage is found in case of a break on the line, as this only cuts out the lamps beyond the break instead of crippling the whole system. Likewise, only the joints between the given lamp and the dynamo interpose their effective resistance, while in series systems any and all bad joints affect the whole number of lamps. The voltage used at the lamps is harmless, they can be trimmed with safety at any time, and it is comparatively easy to plan the feeders for safety.

As to the illuminating power of the lamps, the direct current arcs have the advantage of throwing out most of the light-giving rays in a downward cone, whereas the alternating arc sends out a double cone of light. By using a reflector much of the upward projected light can be thrown downward, and in the case of street lighting a portion of the rays will be reflected from the under surface of the foliage. So I think that for the low suspension commonly used throughout the country the alternating arc is the proper one, while for tower lighting the direct current arc would be preferable.

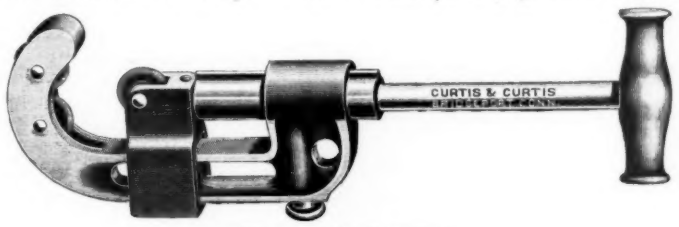
In comparing the energy of the two systems, the commercial efficiency of the dynamos and the cost of armature repairs will also be an important item. Good series generators show an efficiency of from 80 to 85 per cent when built, but after a few years this falls to 70 per cent and often as low as 50 per cent. On the other hand we can count on from 85 to 90 or even 92 per cent when using alternators, and can figure on quite a saving for armature repairs. I have seen figures from 300 arc light stations which average $3 per year per arc lamp for armature repairs alone. This agrees with the commonly known fact that arc armatures are much more likely to be damaged than those of an alternator. I believe that under similar conditions an alternating armature will outlast from two to three arc armatures.

The matter of carbons for alternating arcs has been an important question, as a fine grade is needed for this work. The lamp manufacturers have wisely taken the expedient of using an enclosing globe, so as to make a carbon last 18 hours which otherwise would be consumed in 14 hours. Moreover, the carbon manufacturers in this country are hastening to bring out a grade of carbon suited for alternating current work, and the probability is that we can soon purchase American carbons for these lamps at prices not much in advance of that charged for the hard series arc carbons.

I have already spoken of the greater efficiency which we can readily expect from the alternating generators. We can also get them in larger sizes, so that in place of from 12 to 20 series machines, each with a capacity of 80 to 100 lights, we would have, say, three generators of 300 to 400 horse-power each, these being preferably slow speed machines, connected direct to the engines, thus doing away with belts, ropes and shafting.

At present the common voltage for the primary circuits is about 2,000, having grown to this point from 500, at which it started, and I believe we can assume from 2,000 to 2,500 volts as our settled standard. Still, if I were to plan an ideal arc lighting plant for a large city, I would choose a still higher voltage, perhaps 4,000 volts. My station would be some three or four miles out of town and I would run my wires in conduits to some distributing centers in the city, transforming at these points to 2,000 volts and running thence to the alternating arcs.

Figure out such a plant for a good sized town, and note the saving in circuits alone as compared with series circuits which have only from 50 to 100 lights each. You will then see what the prospects are for the extensive use of alternating currents in connection with street lighting by arc lamps.



THE CURTIS PIPE CUTTER.

The Telephone Dead Beat.

[*Rochester Standard-Union.*]

"If there is a variety of dead beats," said an eminent citizen this morning, "which annoys me more than all others, it is the man who moves into your building because you have a telephone. At first he drops into your office and tells you his wife bade him order a steak before noon and that he had forgotten whether it was porterhouse or sirloin. He says that a family across the street from his house has a 'phone, and with your permission he'll just ring 'em up and have 'em send for Mrs. X. Well, that doesn't bother you much because you are thinking of the family across the street, but in a week or two Mrs. X. begins to call you up with the request to step across the hall and bring her husband to the 'phone. Then the husband begins to drop in to telephone his commercial acquaintances, till two-thirds of his entire business is done over your wire. There is only one more step. One of his agents is up, say in Mount Morris, and it is very necessary to communicate with him immediately. As much as $4 may depend upon a word. He hurries in and says, of course you have connected with Mount Morris. It is marvelous how man's inventions put the miles at naught.

"While you are chalking up 25 cents to profit and loss, he has become the possessor of your telephone. From that time on if you are using it when he comes in, he waits impatiently and gives you a look when you ring off as much as to say, 'Sir, you are taking liberties with my property which I must resent.' There are but two things left to do—take out the telephone or move out yourself. I am fond of my offices, so the telephone had to go."

The Curtis Pipe Cutter.

Curtis & Curtis, of Bridgeport, Conn., have placed on the market the pipe cutter illustrated herewith. While extremely simple in design, it is said to meet all the requirements of such a tool.

The general principle is the same as in all other three wheel cutters, except that this has an exceedingly simple and quick adjustment which will save much time to the operator. Instead of having the screw run through the body of the cutter it is run through a sleeve which in turn slides in the body and is held by a spring-pawl. Thus, in operating the lengthy process of adjusting the cutter to the size of pipe to be cut is avoided, by simply sliding the sleeve until the wheel is against the pipe, when a few turns of the screw, while the cutter is revolved, cuts it off. The range of the No. 2 cutter is from one-eighth to two inches.

ELECTRIC LIGHT FLASHES.

The Ripon, Wis., Light and Water Company has let the contract to St. Paul parties for the construction of an electric light plant to be in operation by August 7.

The Boston Electric Light Company has declared its regular quarterly dividend of two per cent, payable July 14. Transfer books closed June 30 and reopen July 16.

Judge Dallas has dismissed the suit of George Maitland against Alfred C. Gibson, of Philadelphia, for alleged infringement of a patent for combined gas and electric fixtures.

The lower house gas committee at Kansas City, Mo., is trying hard to solve the problem of how to pay $69,000 of gas, electric and gasoline street lights bills with an appropriation of $60,000.

Mayor Schieren, of Brooklyn, N. Y., will sign the resolutions of the aldermen granting franchises to the State Electric Light and Power Company and to the Kings County Electric Light Company.

The electric light plant at Knoxville, Ia., burned on June 13. The building was badly damaged. Three dynamos are ruined, but the engine and boiler are not injured. The estimated loss is $3,000; insurance $2,000.

Two receivers have been appointed for the Woburn, Mass., Electric Light Company. The company has not paid interest on its $65,000 of bonds due last September. It is said to be indebted to the General Electric for $100,000.

At a meeting of the directors of the Chicago Edison Company last week all the old officers were re-elected, as follows: President, Samuel Insull; vice-president, J. W. Doane; secretary and treasurer, F. S. Gorton; comptroller, W. M. Anthony.

Judge Grosscup has issued a preliminary injunction in the suit of the Edison company against several western incandescent lamp manufacturers. This will restrain from manufacturing or selling lamps until the suits are finally disposed of by the court.

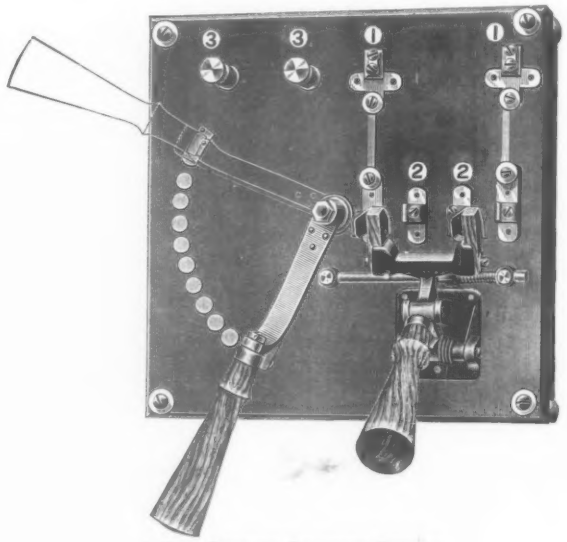
The monster Schuckert search-light that pierced 84 miles of darkness, from Chicago to Milwaukee, during the World's Fair and was purchased by the United States Government, was tried officially for the first time at Sandy Hook on the night of June 26. The tests were to determine whether the light is of practical value for coast defense purposes and for signaling. The trials indicated that the light will do all that the Schuckert company promised.

Prof. John P. Barrett, of Chicago, is at work preparing for the erection of the new electric light plant on the West side, to take the place of the one traded to the Metropolitan Elevated Railway Company. This new station will be on a lot owned by the city and situated just south of West Harrison street, between Blue Island avenue and Halsted street. Prof. Barrett expects to place seven 100 light dynamos in position, and have the plant in operation within 90 days.

The light from the Bartholdi Statue of Liberty on Bedloe's Island, New York harbor, will go out with the ending of the fiscal year, June 30. It will not shine again at the expense of the Federal government unless Congress should refuse to concur in the opinion of the Treasury authorities that the expense involved in the maintenance of this light is unnecessary and make an appropriation for its continuance. The cost of maintaining this light, about $10,000 per annum, is charged against the general appropriation for the care and maintenance of lighthouses. The Lighthouse Board has reported that the light on the statute is of no service whatever as an aid to navigation and, in a spirit of economy, has recommended that it be dispensed with.

A Self-Locking Starting Switch.

We illustrate herewith a very clever device for protecting the armatures of motors when the current is first thrown on. In installing motors the switch and rheostat being generally placed side by side, and being entirely separate from each other, it oftentimes happens that through haste or carelessness the current is thrown on by the switch before the resistance is cut in by the rheostat, and as a consequence the motor armature is burned out or the fuses blown. The W. S. Hill Electric Company, of Boston, Mass., have placed on the market a patent self-locking starting switch, in which the switch and rheostat are combined in such a manner that the switch cannot be thrown in without first putting in all of the resistance; this avoids any possible chance for an accident of any kind. Besides, the price is less than that of a switch and rheostat separate, thus offering the inducement of economy, as well as saving the risk of accident to the motor by its use.



A Self-Locking Starting Switch.

Wire Manufacturers Eat Clams.

Mr. Eugene F. Phillips, president of the American Electrical Works, Providence, R. I., gave a clam bake on Thursday, June 28, to the manufacturers of bare and insulated copper wire. The bake was served at the Ponham Club, on Narragansett Bay, and with Mr. Phillips as the genial host, was greatly enjoyed.

ELECTRIC RAILWAY NOTES.

Electric cars are now running between Cuyahoga Falls and Akron, Ohio.

An increase of 100,000 shares of stock, representing $5,000,000, has been voted by the stockholders of the Philadelphia Traction Company.

The projectors of the proposed new belt line street surface electric railroad in Cohoes, N. Y., have subscribed $16,460 and thus assured its success.

The Villard syndicate will have to pay $75,000 taxes on its Milwaukee street railway possessions this year unless the courts declare the assessment invalid.

The North Jersey Street Railway Company has been incorporated with $5,000,000 capital to operate 250 miles of electric street and road railways in northern New Jersey.

The Baltimore & Ohio Railroad has got a seven years' extension of its control of the Chesapeake and Ohio canal, and it is reported that it will operate it by electricity.

The contract of the General Electric Company with the Metropolitan Elevated, of Chicago, calls for 110 railway motors of the large type, two 1,500 and two 750 kilowatt generators and all other electrical apparatus on the intramural system.

The Joplin, Mo., Electric Railway and Motor Company will soon begin the extension of their line to Galena, Kas. The city of Joplin will be asked to contribute from $3,000 to $5,000 for the enterprise. The proposed extension will cost the company $75,000 to $80,000.

A project for an electric railroad between Washington and New York has been brought before Congress in a bill for the incorporation of the National Rapid Transit Railway Company. Ex-Representative Hemphill, of South Carolina, and Washington capitalists are interested in the road.

The Sioux City Traction Company, with a capital of $1,000,000, has arranged to succeed the Sioux City Street Railway Company in the ownership and operation of the 40 miles of electric street railway which it got by foreclosure. The new company is composed of bondholders of the old. Of the stock, $630,000 was paid for in bonds, and the balance in cash. D. L. Wright, E. F. Stone and J. C. French, of Sioux City, and M. L. Kohler and J. W. Harner, of Philadelphia, are the directors and corporators.

The annual meeting of the Citizens' Street Railway Company, of Kalamazoo, Mich., was held last week. The following officers were elected for the ensuing year: Theo. P. Bailey, president, Chicago; Geo. J. Kobusch, vice-president, St. Louis, Mo.; Jas. W. Johnson, treasurer, Chicago; E. E. Downs, general manager, Kalamazoo. Mr. Downs succeeds G. K. Wheeler as general manager. The officers were well pleased with the city and predict a bright future for the road. The election of Mr. Downs as general manager is very gratifying to his many friends in Kalamazoo. Under his management of the road Kalamazoo has had one of the best street car services in the country.

Judge Burlingame has decided the case of the South Grand Rapids, Mich., Street Railway Company against the city to restrain the city from tearing up its tracks. The court holds that the city had no right, under any circumstances, to interfere with the tracks, and if the city was allowed by the company to take up tracks in order to grade the streets the city must relay them at its own expense. The suit is of more than ordinary interest. The street car line was built under a township franchise before the city limits had been extended. The city assumed exclusive control over the street and sought to compel the company to relay its tracks after the re-grading of the street. Charles Fox, as president of the company, protested.

Mr. Edison Meets With a Mishap and Mrs. Edison is Threatened by a Crank.

There was plenty of excitement in the Edison household at Orange, N. J., last week. Mr. Edison was brought home ill from his iron mines at Ogden, N. J., and Mrs. Edison received a threatening letter from a crazy crank who was afterwards captured and confined.

Mr. Edison was sitting in a chair on the veranda of his house at Ogden when the chair gave way or slipped and caused him to fall down four steps to the ground. He was picked up, and although no bruises could be found he was seen to be ill and was taken to his home at Orange. His physician found that Mr. Edison was suffering from the heat and too much work and ordered him to bed, where he stayed all of last week. He is now reported to be almost himself again and will soon return to Ogden.

A New Engine Company.

The Rice & Sargent Engine Company, of Providence, R. I., has been incorporated. Offices have been established at 40 Codding street. The officers of the company are R. A. Robertson, president; Z. Chafee, vice-president; John W. Sargent, secretary; and Richard H. Rice, treasurer.

Direct Coupled Engine and Dynamos.

The direct-coupled dynamos and engine recently installed in the station of the Edison Electric Light Company, at Grand Rapids, Mich., present some features of interest and deserve special notice. The outfit, shown in the illustration on this page, consists of one 4 valve compound condensing engine, 15x24x24, rated at 300 to 400 horse-power, built by Russell & Company, of Massillon, Ohio, and two 100 kilowatt generators made by the General Electric Company, Schenectady, N. Y.

The bed of the engine and the fields of the dynamos rest upon a common iron base. The main shaft of the engine, carrying in addition to the fly wheel the two armatures, is supported in two pillow blocks mounted on detachable iron stands so that the armatures may be removed without lifting the shaft out of place.

A test conducted by Mr. Frank A. Simonds, M. E., to determine the engine's economy in verification of guarantees, is reported to have yielded the following results:

RUNNING NON-CONDENSING.

Duration trial six hours.	
Average steam pressure.	139.5
" revolutions per minute..	162.
" I. H. P. developed....	307.74
Water per I. H. P.	18.45

RUNNING CONDENSING.

Duration trial six hours.	
Average steam pressure.	130.
" vacuum.	25.75
" revolutions.	162.
" I. H. P.	327.75
Water per I. H. P.	15.59

Westinghouse News.

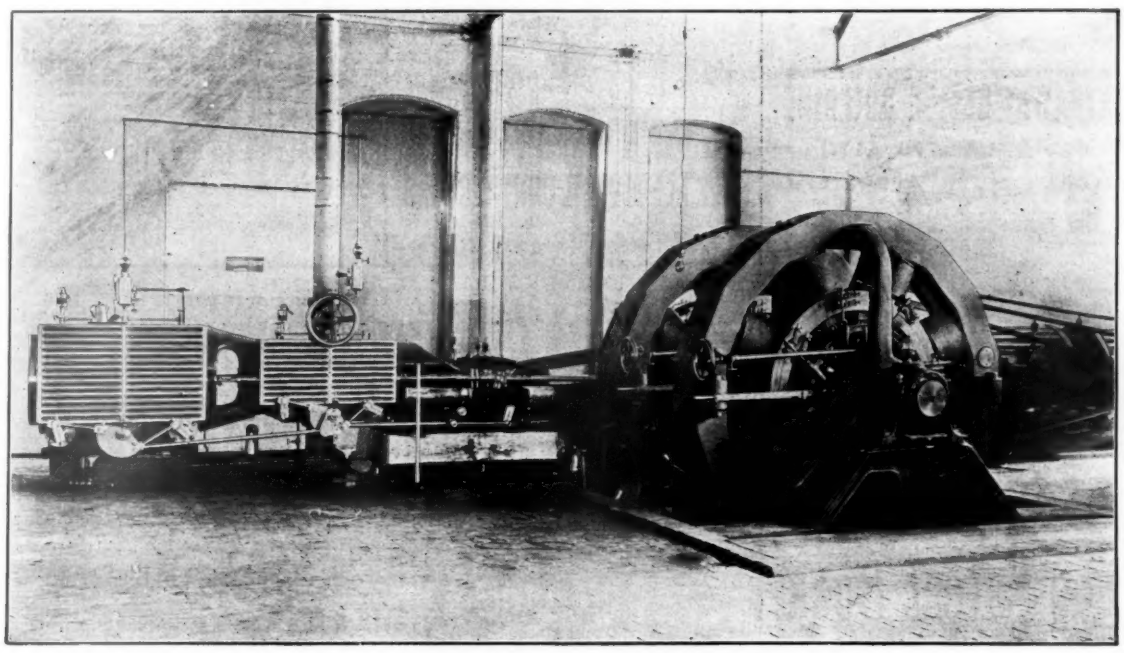
It is reported that the Westinghouse Electric and Manufacturing Company is doing a very steady business, its manufacturing output last month footing up about $550,000, with orders received for about the same amount of new apparatus. The payroll of the company shows a slight but almost continual increase.

The company is now turning out about 4,000 lamps per day, as its new glass works are a success. It has bought 14 acres of additional land at Brinton, Pa., making 37 acres for its new works. The additional land is for the construction of two other buildings, one for a blacksmith shop and one for an establishment to cut or punch out the laminated iron for electric converters, armatures, etc.

An active campaign is contemplated in the local electric lighting field in New York. The new factory will have a capacity for 30,000 lamps per day, and the new works should be well in operation by October 1. The price of the new lamps will be 25 cents to users of Westinghouse apparatus, with possibly 20 per cent discount for large lots. The value of the returned bulb will be four cents instead of 10 cents.

The Ball & Wood Company Gets a Good Contract.

The Ball & Wood Company, of New York, has again been successful in securing through its secretary and treasurer, Mr. Vincent, one of the largest power contracts which has recently been placed. The order comprises six Ball & Wood improved cross compound condensing engines of 300 horse-power each, for the Hartford Street Railway Company, of Hartford, Conn. It is this type and make of engine which has proved so economical and efficient at the Grand street station of the Consolidated Traction Company in Jersey City, where the duty has been most severe and the engines subjected to almost constant overloads of from 20 to 50 per cent, pending the increase of the power plant. The factory of the Ball & Wood Company has been running 24 hours per day since about June 1, and this Hartford contract will permit no diminution of its force for some weeks. In times like these such activity is unusual, and it reflects the popularity of these engines, which are indeed remarkable for their reliability.



DIRECT COUPLED ENGINE AND DYNAMOS.

The directors of the Canadian Bell Telephone Company have decided to increase the company's capital from $2,640,000 to $3,168,000.

TELEPHONE NEWS AND COMMENT.

Logansport, Ind., is to have a new telephone exchange.

The new telephone company that was going to be established in Augusta, Ga., has fallen through.

Microbes in transmitters! Occasionally we hear of "bugs" on the line, but now it would seem they had crawled into the transmitters.

The Nebraska Telephone Company has reduced its rates for use of its toll lines between the hours of 8 P. M. and 7 A. M. to one-half of the rates heretofore charged.

The Harrison International Telephone Company has reduced its stock from $80,000,000 to $40,000,000. The latter figure was deemed sufficient for the needs of the company.

The Central Union Telephone Company has commenced work on the long-distance telephone line between St. Louis and Chicago *via* Alton, Springfield, Bloomington and Joliet. The line will follow the Chicago and Alton Railroad.

The Chicago Telephone Company is placing 14 telephone stations along the drainage canal, for which an annual rental of $3,000 will be paid. This arrangement will enable the sanitary trustees to communicate with the contractors at any hour.

One Geo. W. Bumphrey, who contracted to put up the poles for the new People's Telephone Company at St. Joseph, Mo., is reported among the missing. He was to have paid off his men with the $1,000 guarantee returned by the City Council, but failed to appear.

The New England Telephone Company has just adopted a new form of lightning arrester which is thought to be an improvement over those now in use. Newburyport, Mass., has been selected as the place for trial of the new device, and Manager Welch will soon attach them to the more important lines.

The output of the American Bell Telephone Company for the month ending June 20 was as follows:

	1894.	1893.	Inc.	Dec.
Gross output	9,126	9,290	....	164
Returned	6,316	4,812	1,504	....
Net	2,810	4,478	....	1,668
Since Dec. 20:				
Gross output	41,025	52,349	....	11,324
Returned	34,695	27,934	6,761	....
Net	6,330	24,415	....	18,085

The telephone company which has been in operation at Kalamazoo, Mich., for the past 15 years has no charter or ordinance governing it. The City Council just discovered this when the Harrison telephone men asked for a franchise. Steps are being taken to collect a tax and place them under municipal supervision.

The Boston *Advertiser* speaks of the National telephone as follows: "This company makes an interesting announcement on the last page to-day proving the superiority of their instruments. We have used one of their telephones running from the lower to the seventh floor in our office for several years and it has proved to be reliable and satisfactory in every respect."

We thought the new telephone scare would get around to the innocent operators yet. The Columbus, Ga., *Sun* says: "The latest startling discovery of science is that the telephone is infested with bacteria, which may become a source of disease. However, that is not the chief trouble with the telephone. The public would cheerfully risk the bacteria if the telephone girl and the wire would be a little more prompt in the discharge of their respective duties."

Alice Lavery, formerly an employé of the Chicago Telephone Company, commenced suit against the company, asking $30,000 for personal injuries. She was sitting at her place in front of the big switchboard when, she declares, she received a tremendous electric shock which threw her to the floor in a spasm. A thunderstorm was raging outside at the time and owing to a defective "lightning arrester," she tells the court, the accident occurred. Since that, the plaintiff asserts, she has become a hopeless invalid.

The Nebraska Telephone Company's new exchange in the Baldwin Block, Council Bluffs, Iowa, was auspiciously opened a few days ago. Ladies and gentlemen of the city were invited to be present, and the event was a very delightful one indeed. Manager C. A. Atkins was in charge. The new exchange has been put in at a cost of over $10,000, and the change from the old to the new exchange was made so promptly and easily that none of the subscribers knew when it occurred. The system is the improved multiple from the factory of the Western Electric Company.

KINDRED INTERESTS

Smith, Gray & Company, the well-known clothiers of Brooklyn, N. Y., have opened a new store at Broadway and Thirty-first street, New York, where some tasteful electric lighting effects may be seen.

Messrs. Lord & Thomas, the well-known advertising men of Chicago, have sent the ELECTRICAL REVIEW a very attractive calendar, beginning July 1. This comes in at an excellent period fresh and clean to replace other calendars issued six months ago.

The Peru Electric Manufacturing Company, Peru, Ind., has issued an illustrated general catalogue giving information on its Laclede and Hercules batteries, Edison and Sawyer-Man main and branch cut-outs, rosettes, wall receptacles, key and keyless sockets for all systems.

Pierce & Richardson, 1409 Manhattan building, Chicago, are mailing a new catalogue describing their storage batteries. It contains considerable descriptive matter that will interest users of batteries, and has tables showing the rates of discharge and efficiencies under various conditions.

A. O. Schoonmaker, 158 William street, New York, makes a specialty of solid sheet East India mica for insulating purposes. Mr. Schoonmaker receives this mica direct from the original sources in India and is prepared to supply it in any shape or form required by the electrical trade.

The Stanley Electric Manufacturing Company, Pittsfield, Mass., has issued a superb catalogue of its new apparatus for the transmission of power by two phase alternating currents. No effort or expense has been spared to make this catalogue complete and artistic in every detail.

The Harrison Telephone Company, it is reported, is now sending orders to its factory in Chicago for about 2,500 telephones per month, and since March 21 it has ordered 6,000 telephones. It is said that Toledo will take 1,400. The policy of the Harrison company is to offer exchange rates at 50 per cent of Bell company prices.

Readers of the ELECTRICAL REVIEW will receive a convenient pamphlet if they will drop a postal card to M. W. Mix, 170 South Clinton street, Chicago. The cover design should be carefully studied, and the fact borne in mind that the latch string is always out, and the horseshoe right side up to hold the good luck that Mr. Mix has deservedly won.

The Holtzer-Cabot Electric Company, of 92 Franklin street, Boston, is one of the most widely known electrical houses in New England. They manufacture and deal in all kinds of electrical specialties and also dynamos and motors. They have just completed a new catalogue which will be sent to all who enclose their business card. Readers of the ELECTRICAL REVIEW should avail themselves of this opportunity to secure the latest electrical catalogue.

The Joseph Dixon Crucible Company, Jersey City, N. J., have sent out an instructive leaflet giving a record of service tests of hoisting tackle recently made by Robert Grimshaw, M. E., at the Brooklyn Navy Yard, in collaboration with Lieutenant John A. Bell, of the Equipment Bureau, United States Navy. Dixon's waterproof graphite grease gained another well-merited victory. If you are interested in lubrication in any way ask for one of these leaflets. They are free.

The New and palatial Norwich line Steamer "City of Lowell" is, in speed and appointments, one of the finest vessels in the Sound service. During the Summer season a first-class orchestra will furnish music for the patrons of the Norwich line steamers, and in addition to this innovation the management has provided a new 75 cent *table d'hôte* dinner and arranged to supply its patrons with the latest magazines and other literature. In every way it will strive to provide for the comfort and enjoyment of the traveling public.

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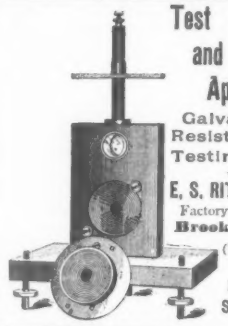

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